Remarks

I. Claim status

Claims 1-29 were pending. Claim 30 has been added.

Claims 23 and 29 have been amended and claim 24 has been canceled without prejudice.

Claim 27 has been rewritten in independent form in response to the Examiner's indication that such a claim would be allowed. Therefore, claim 27 and claim 28, which depends from claim 27, now are in condition for allowance.

The Examiner has indicated that claims 7, 15, 16, 18-21, 27, and 28 would be allowable if rewritten in independent form.

II. Claim rejections under 35 U.S.C § 102

A. Claims 1-6, 8-14, 17, and 22

The Examiner has rejected claims 1-6, 8-14, 17, and 22 under 35 U.S.C. § 102(b) over Tow (EP 0 493 053). Claims 1 and 22 are independent claims. Claims 2-6, 8-14, and 17 depend from independent claim 1.

Each of independent claims 1 and 22 requires halftoning of regions of an original image incorporating errors diffused among regions of the original image and computed based at least in part upon modulations in the graphical bar code corresponding to a graphical encoding of a message.

The Examiner has asserted that Tow discloses:

> Halftoning regions of an original image incorporating error diffused among regions of the original image (See Tow, figure 1, col. 3, lines 11-13, Tow shows modulating the average reflectance of halftone cells in accordance with spatially corresponding grayscale image samples i.e., Tow shows incorporating error diffused among regions of the original image) and
>
> computed based at least in part upon modulation in the graphical bar code (See Tow, col. 3, lines 20-23, Tow shows

> modulating the average reflectance of halftone cells in accordance with spatially corresponding grayscale image samples i.e., Tow shows computed based at least in part upon modulation [modulating the average reflectance of halftone cells] in the graphical bar code [corresponding grayscale image samples] and Tow shows in col. 2, lines 45-46, modulating angular orientation of halftone pattern in with digital data values [bar code]),
>
> corresponding to a graphical encoding of a message (Tow shows col. 2, lines 45-46, "modulating angular orientation of halftone pattern in with digital values thereby embedding the digital data in the halftone image" i.e., corresponding to a graphical encoding of a message).

Contrary to the Examiner's conclusion, however, Tow's method does not perform the halftoning process recited in claims 1 and 22, in which *regions of an original image incorporating errors diffused among regions of the original image undergo halftoning*. Indeed, Fig. 1 clearly shows and the description at col. 3, lines 11-34, clearly explains that the halftone generator 52 in Tow's halftone imaging system 51 performs halftoning on *grayscale samples of the input image* (see, e.g., col. 3, lines 16-18). The grayscale input image samples correspond exactly to respective portions of the input image and therefore they do not contain any errors, and they certainly do not contain any diffused errors that are computed based at least in part upon modulations in the graphical bar code corresponding to a graphical encoding of a message. Tow does not even hint that anything other than the grayscale input image samples could be input into the halftone generator 52. Moreover, Tow's system 51 does not compute any errors, much less compute any errors based at least in part upon modulations in a graphical bar code corresponding to a graphical encoding of a message.

Regarding the details of the process of generating halftone cells of a digital halftone image from the grayscale input image samples, Tow explains that (col. 2, lines 34-42):

> In keeping with standard practices, the sizes of these halftone dot patterns are modulated in accordance with the grayscale data sample values that are provided to define the image, so the average reflectance or transmittance ... of each of the halftone cells is modulated to provide a more or less standard halftone rendering of the image.

That is, the sizes of the dot patterns in the halftone cells used to generate the halftone image are selected based on the grayscale values of the corresponding grayscale input image samples (see, e.g., col. 3, lines 23-28). Contrary to the Examiner's assertion, Tow's halftone

generator 52 does not select (or compute) the halftone cells based upon modulations in the resulting halftone image (i.e., the graphical bar code that contains the embedded digital data). Indeed, Tow's halftoning process proceeds without any regard whatsoever to the halftone image that is produced by the halftone imaging system 51.

For at least these reasons, the Examiner's rejection of independent claims 1 and 22 under 35 U.S.C. § 102(b) over Tow should be withdrawn.

Each of claims 2-6, 8-14, and 17 incorporates the features of independent claim 1 and therefore is patentable for at least the same reasons explained above. Claims 2-6, 8-13, and 17 also are patentable for the following additional reasons.

Claim 2 recites that halftoning comprises computing quantization errors for respective regions of the graphical bar code. In his rejection of claim 2, the Examiner has asserted that "Tow shows modulating the average reflectance of halftone cells in accordance with corresponding grayscale image samples." Such modulation of halftone cells, however, does not constitute a computing of quantization errors. Indeed, Tow explains that his halftoning process merely involves retrieving preprogrammed halftone cells that have average reflectance values in accordance with the grayscale input image samples. This process does not involve computing quantization errors.

Claim 3 incorporates the features of claim 2 and therefore is patentable for at least the same reasons explained above. Claim 3 also is patentable for the following additional reasons. Claim 3 recites that the computed quantization errors are invariant to the graphically encoded message. The Examiner has asserted that "Tow shows modulating the average reflectance of halftone cells i.e., average reflectance of halftone is quantization error which invariant to grayscale image samples [bar code]." Contrary to the Examiner's incorrect conclusion, the average reflectance of a halftone cell is not a quantization error. A quantization error is an artifact caused by the limited intensity resolution of a halftone image. In addition, contrary to the Examiner's assertion, the grayscale image samples do not constitute a bar code. The grayscale image samples correspond to the grayscale input image; the halftone image corresponds to a bar code that includes embedded digital data. In any event, claim 3 recites that the computed quantization errors are invariant to the graphically encoded *message*, not to the *bar code* as asserted by the Examiner.

Claim 4 incorporates the features of claims 2 and 3 and therefore is patentable for at least the same reasons explained above. Claim 4 also is patentable for the following

additional reasons. Claim 4 recites that average block errors are diffused among regions of the original image. In his rejection of claim 4, the Examiner has asserted that "Tow shows modulating the average reflectance of halftone cells in accordance with spatially corresponding grayscale image samples." For the reasons explained above, such a modulation of the average reflectance of halftone cells does not constitute a computation of average block errors.

Each of claims 5-13 incorporates the features of claim 2 and therefore is patentable for at least the same reasons explained above.

Claim 17 recites that one or more of the graphical code words are non-information-encoding and the remaining graphical code words are information-encoding. The Examiner has indicated that:

> Regarding claim 17, Tow discloses one or more graphical code words are non-information and remaining code words are information encoding (See Tow, col. 4, lines 3-6, some halftone cells are cross hatched which are background pixels i.e., background cells are non-information and the rest information cells).

The Examiner has misconstrued Tow's teaching. According to Tow (col. 4, lines 2-10; emphasis added):

> Focusing in some additional detail on Fig. 2, it will be seem that some of the *pixels* of the halftone cell 61 are crosshatched to indicate that they are not included in the fill order. Instead, these crosshatched *pixels* are set aside to function as dedicated background *pixels* for all of the halftone dot patterns. This has been done to maintain the circular asymmetry of the dot patterns and to simplify the task of discriminating between their different permissible angular orientations...

In this quoted passage, Tow explains that each code word includes some background *pixels*. Contrary to the Examiner's assertion, however, this section of Tow does not teach that some of the halftone *cells* are non-information-encoding. Indeed, there is no teaching or suggestion anywhere in Tow's disclosure that even hints that some of the halftone *cells* could be non-information-encoding.

B. Claims 23, 26, and 29

The Examiner has rejected claims 23, 26, and 29 under 35 U.S.C. § 102(b) over Cass (U.S. 6,141,441).

Each of claims 23 and 29 has been amended to incorporate the features of claim 24 and are patentable for the reasons explained in section III below.

Claim 26 incorporates the features of independent claim 23 and therefore is patentable for at least the same reasons as claim 23.

III. Claim rejections under 35 U.S.C § 103

The Examiner has rejected claims 24 and 25 under 35 U.S.C. § 103(a) over Tow in view of Cass.

Claim 24 has been canceled without prejudice. However, the features of claim 24 have been incorporated into independent claims 23 and 29; each of claims 25 and 26 incorporates the features of independent claim 23. Claims 23, 25, 26, and 29 are patentable over the teachings of Tow and Cass for the following reasons.

Each of claims 23, 25, 26, and 29 recites that a base image having halftone regions representative of an original image is generated by halftoning regions of the original image incorporating errors diffused among regions of the original image and computed based at least in part upon modulations in the graphical bar code corresponding to a graphical encoding of a preselected message. As explained above in connection with claim 1, Tow fails to teach or suggest anything about performing a halftoning process, in which *regions of an original image incorporating errors diffused among regions of the original image undergo halftoning*. Cass fails to make-up for Tow's failure to teach or suggest such a halftoning process. Accordingly, no permissible combination of Tow and Cass could possibly teach or suggest the inventive combination of features now recited in claims 23, 25, 26, and 29.

For at least these reasons, the Examiner's rejection of claims 23, 25, 26, and 29 over Tow and Cass, taken alone or in any permissible combination, now should be withdrawn.

IV. Conclusion

For the reasons explained above, all of the pending claims are now in condition for allowance and should be allowed.

Charge any excess fees or apply any credits to Deposit Account No. 08-2025.

Respectfully submitted,

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